OPT MACHINE VISION TECH.CO. LTD
ADD:8 JingSheng Road, JingXia ChangAn DongGuan China 523853
TEL: 0769-82716188 FAX: 0769-81606698
E-mail:optmv1@optmv.com Website:Http://www.optmv.net

OPT-DPA1024E-4
LED lighting controller manual

OPT MACHINE VISION TECH.CO.,LTD.

Revised in Dec.2014

OPT MACHINE VISION TECH.CO. LTD
ADD:8 JingSheng Road, JingXia ChangAn DongGuan China 523853
TEL: 0769-82716188 FAX: 0769-81606698
E-mail:optmv1@optmv.com Website:Http://www.optmv.net

Copyright reserved

1、All the logos and names in this manual belong to OPT.

2、All copyright reserved by OPT company, the original author. Replication and distribution of the contents in any form, anywhere without permission from our company is straightly prohibited. Revisions are subject to change without prior notice.

Caution and warning:

Caution and Warning	
	This product should be connected to 220V AC power supply. Please ensure that the power switch controller is off when plugging in/out the power to prevent against electric shock.
	Please read the manual carefully in advance and strictly follow the instructions when operating the product.
	In case of any abnormal situation, please contact us and never disassemble the product by yourself.
	Please make sure good ground for the controller to avoid electric shock.
	Do not stare directly into the light given out from the LED since it do harm to your eyes. If a specular object is used, please take care not to let reflected light to enter your eyes.

OPT MACHINE VISION TECH.CO. LTD
ADD:8 JingSheng Road, JingXia ChangAn DongGuan China 523853
TEL: 0769-82716188 FAX: 0769-81606698
E-mail:optmv1@optmv.com Website:Http://www.optmv.net

Contents

1、Overview ····· 5
1.1 Profile ····· 5
1.2 Selection guidance ····· 5
1.2.1 Accessory selection guidance ····· 5
1.3 Parameter description ····· 6
1.4 Panel description ····· 7
1.5 Function description ····· 8
1.5.1 Automatically/Manually checking/setting the maximum current ····· 8
1.5.2 General/ Highlight trigger mode ····· 8
1.5.3 Error code ····· 8
1.5.4 Working mode switch ····· 9
2、Installation Guidance ····· 10
2.1 DIN guide rail installation ····· 11
2.2 Screw installation ····· 11
2.3 Installation size ····· 11
3、Operation Instructions ····· 12
3.1 Wiring diagram ····· 12
3.2 Turn on light source ····· 12
3.3 Setting intensity ····· 13
3.4 External trigger ····· 13
4、Software Operation Instructions ····· 14
4.1 Software interface description ····· 14
4.2 Software function description ····· 18
5、Appendix A: Mechanical parameter ····· 19
6、Appendix B: Programming Manual ····· 23
1. Overview ····· 23
1.1. Configuration ····· 23
1.2. Controller default settings ····· 23
1.3. Programming flowchart ····· 23

1.4. Example programs ····· 24

2. Function Specification ····· 27
2.1. Initializing a serial port ····· 27
2.2. Releasing a serial port ····· 27
2.3. Creating an Ethernet connection (by IP) ····· 28
2.4. Creating an Ethernet connection (by SN) ····· 28
2.5. Destroying an Ethernet connection ····· 29
2.6. Turning on channel(s) ····· 29
2.7. Turning on multiple channels ····· 30
2.8. Turning off channel(s) ····· 30
2.9. Turning off multiple channels ····· 31
2.10. Setting intensity ····· 31
2.11. Setting multiple intensity ····· 32
2.12. Reading intensity ····· 32
2.13. Setting the trigger pulse width ····· 33
2.14. Setting multiple trigger pulse width ····· 33
2.15. Reading the trigger pulse width ····· 34
2.16. Setting high brightness trigger pulse width ····· 34
2.17. Setting multiple high brightness trigger pulse width ····· 35
2.18. Reading the high brightness trigger pulse width ····· 35
2.19. Enable response ····· 36
2.20. Enable checksum ····· 36
2.21. Enable back up when power off ····· 36
2.22. Reading serial number ····· 37
2.23. Reading IP configuration ····· 37

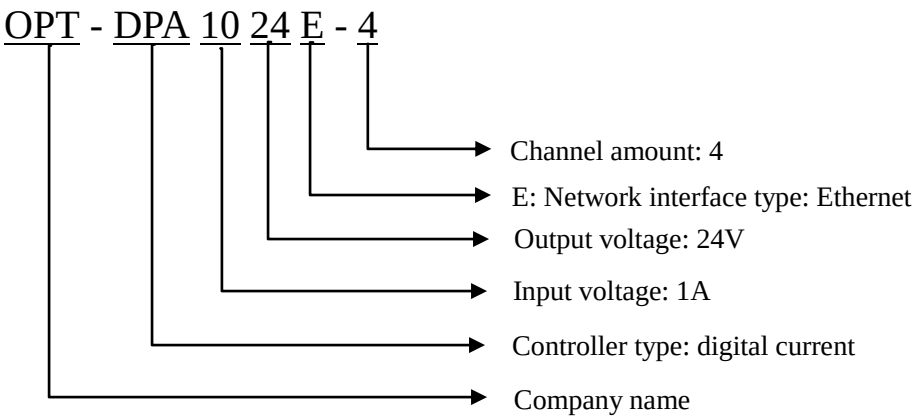
3. Appendices ····· 38
A FAQ (frequently asked questions) ····· 38
B Macro Definitions for Error Codes ····· 38
C Acronyms ····· 39

1、Overview

1.1 Profile

This digital power controller unit (No: OPT-DPA1024-4) is a digital constant current controller which possesses the following functions: 256-levelled intensity adjustment (The adjustment for each channel is independent.); highlight triggering; general triggering; trigger delay; automatically checks for light source maximum current (hot swapping light source); manually setting the maximum output current; 100M Ethernet communication; RS232 communication.

1.2 Selection guidance


OPT - DPA 10 24 E - 4
Channel amount: 4
E: Network interface type: Ethernet
Output voltage: 24V
Input voltage: 1A
Controller type: digital current
Company name

1.2.1 Accessory selection guidance

1、Network cable：

Factory standard network cable: CAT6 or later, 3m length

Cable requirement: CAT6 or later, no longer than 50m

2、Router or switch

Choose well-known brands. The transmission speed is no less than 100Mbps

recommended type：

Router: NETGEAR (from USA) WGR614 (150Mbps)

Switch: NETGEAR (from USA) FS308（8 ports, 100M）

OPT MACHINE VISION TECH.CO. LTD
ADD:8 JingSheng Road, JingXia ChangAn DongGuan China 523853
TEL: 0769-82716188 FAX: 0769-81606698
E-mail:optmv1@optmv.com Website:Http://www.optmv.net

1.3 Parameter description

Item	Parameter	Remark
Input voltage	AC: 100-240V	
Automatically checks for load maximum current	Connects 10mA-1A, 24V light source	
Manually set the maximum output current	Range: 10mA - 1A	
Adjustable intensity level	256	Adjusted via front panel encoder or software
Short-circuit protection	Enabled	If the controller is short-circuited, the short-circuit protection will turn off the corresponding channel with error message “ER2” from LED.
Overcurrent protection	Enabled	If overcurrent occurs, the overcurrent protection will turn off the corresponding channel with error message “ER1” from LED.
General trigger mode	Intensity level: 0-255, adjustable	See Sect.1.5.6
Highlight trigger mode	The current is 1A for single channel.	See Sect.1.5.6
General trigger delay	1-999ms	Configurable by front panel encoder or software
Highlight trigger delay	0.01-5.00ms	Configurable by front panel encoder or software
Load capacity	1A/CH 2.2A/4CH	Can only connect 24V light source
Communication mode	RS232/Ethernet	
Temperature controlled fan	Fan activate at 20℃ and reaches maximum RPM at 30℃.	
Standby power	<3W	
Insulation	AC 1500V at 1Min	leakage current < 10mA
Insulation resistance	DC 500V	Insulation resistance >20MΩ
Working temperature	-5-50℃	

Dimension size	91*134.41*171mm	
Weight	1kg	

1.4 Panel description

Fig.1.1: front panel

Index	Panel	Description	Remark
1	4-digit LED	From left to right, the 1st digit equals the channel index and the remaining three digits are decimal representation of the corresponding channel parameter. See Sect.3.3 & 3.4.	
2	Working mode switch	Switch working mode, see Sect. 1.5.6	
3	Serial port	For communication with PC via RS232	
4	100M Ethernet port	For communication with PC via Ethernet	

5	AC input	Input: AC 100-240V 50/60Hz	
6	Encoder	Adjust intensity and trigger delay	
7	Light source interface	4 light source output and they are independent with each other	
8	Trigger port	Connected to external trigger source and perform synchronous strobe	The trigger delay is adjustable
9	Power switch	Turn on/off controller power supply	

1.5 Function description

1.5.1 Automatically/Manually checking/setting the maximum current

This feature is enabled by software only. By default the controller will automatically adjust the controller to light sources with current 10mA-1A and voltage 24V. This feature can be overridden by software.

1.5.2 General/ Highlight trigger mode

The controller can enter the two modes by turning the working mode switches accordingly (For general trigger mode switch 1 “OFF”, switch 2 “ON” while for highlight trigger mode, both switch 1 and switch 2 are “OFF”). Set the trigger delay through adjusting the encoder or software. The range of the adjustable intensity is 0-255. Optocoupler isolation is built in. For voltage 0-4V, the optocoupler isolation is not conductive and it becomes conductive when the voltage is within 7 -24V. For default, it is positive edge triggered.

1.5.3 Error code

Code	**Error description**	**Reaction**	**Recover**
ER0	Not connected to any light source		
ER1	Overcurrent	Launch the overcurrent protection for the corresponding channel and turn it off.	Correct error and reboot
ER2	Short-circuit	Launch the short-circuit protection for the corresponding channel and turn it off	Correct error and reboot
ER3	Overvoltage	Launch the overvoltage protection for the corresponding channel and turn it off.	Correct error and reboot

1.5.4 Working mode switch

Mode	Switch 1	Switch 2
General lighting mode	ON	ON
Automatically checks for load current once	ON	OFF
General trigger mode	OFF	ON
Highlight trigger mode	OFF	OFF

Note: (1) DPA1024E-4 controller can only connect 24V light source.

(2) The maximum current is 1A for single channel and 2.2A for 4 channels.

(3) When manually setting the maximum output current, never connect the controller to the light source with current lower than the maximum output current. Otherwise, it may damage the light source because of current mismatch.

(4) Automatically checks for load current once mode: When turning to this mode, the controller will recheck the load maximum current once.

2、Installation Guidance

Index	Interface	Description	Remark
1	Screw hole	Install screw	
2	DIN rail track	Standard DIN rail installation	

2.1 DIN guide rail installation

1、Installation (Fig.2.1): (1) Lock the controller back panel DIN rail track to position 1 rail.
(2) Push down controller toward position 2.

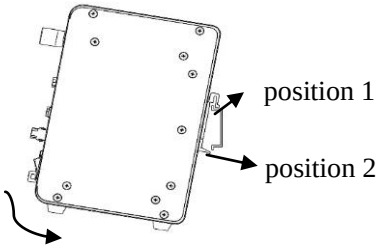


Fig. 2.1: Guide rail installation

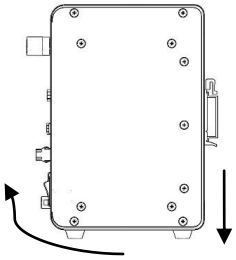


Fig.2.2: Guide rail Uninstallation

2、Uninstallation (Fig.2.2): (1) Pull down the controller.
(2) Push up toward position1.

2.2 Screw installation

Installation (Fig.2.3):

1、Secure back-plate against controller.

2、Tighten the screws.

3、Tighten the back-plate to fixtures or stations.

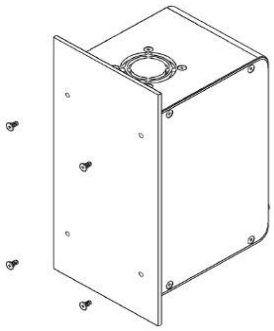


Fig.2.3: Screws installation

2.3 Installation size

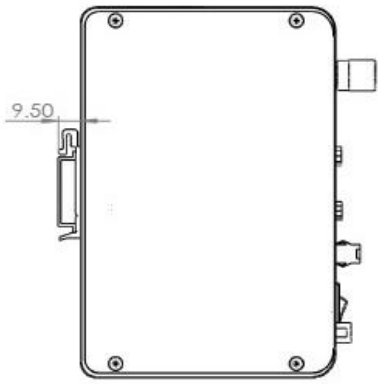


Fig.2.4: DIN guide rail size

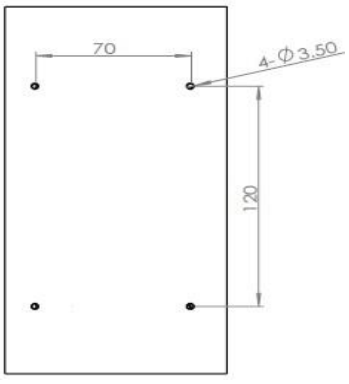


Fig.2.5: Screw size

3、Operation Instructions

3.1 Wiring diagram

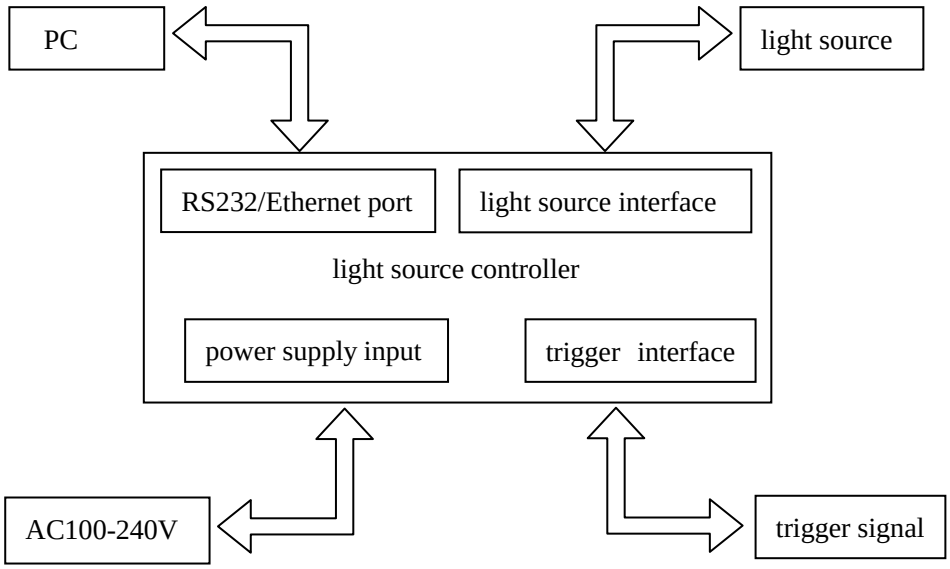


Figure 6: Wiring diagram

Step1: Connect the light source to controller (See Fig. 6).

Step2: If the external trigger control is necessary, connect the external trigger source to the controller (See Sect. 3.4).

Step3: Connect power source (AC100-240V) and turn on the power source. If the digital LED displays channel index then the power is on.

If one needs to adjust the intensity through software, please connect the controller with ***power off*** to PC via RS232 or Ethernet. Run our Demo program or one's own program (i.e. SDK also available). The parameters for channels can still be overridden manually via front panel while communicating through serial port or Ethernet (i.e., both host computer and the controller can be individually adjusted). There is no need to switch the working mode. For the introduction of our Demo program, please refer to Sect. 4 – "software operation instruction" and Sect.6 – "program manual".

3.2 Turn on light source

step1: Turn off the controller.

step2: Connect the light source.

step3: Turn on the controller.

3.3 Setting intensity

1、manually setting: Turn both the switch 1 and switch 2 on the front panel to “ON” position to enter the general lighting mode. Push the encoder. The first digit of the LED will blink. Now one can choose the channel(s). Clock-wise turning the encoder will increase the index of the channel whereas counter clock-wise turning will decrease the index. The remaining digits indicate the intensity level (0-255) in decimal form (i.e., for the highest intensity, set the 2nd digit= 2, the 3rd digit= 5, the 4th digit=5). Push the encoder again to store the value and the LED will stop blinking. Repeat above steps for the remaining channels.

2、setting via software: See Sect.4 - “software operation instruction”

3.4 External trigger

There are 4 trigger interfaces. COM is the common external trigger negative input signal and TRIG 1、2、3、4 is the external trigger positive input. Optocoupler isolation is built in. For voltage 0-4V, the optocoupler isolation is not conductive and it becomes conductive when the voltage is within 7 -24V. For default, it is positive edge triggered.

The controller can enter general/highlight trigger mode by turning the working mode switches accordingly (For general trigger mode switch 1 “OFF”, switch 2 “ON” while for highlight trigger mode, both switch 1 and switch 2 are “OFF”). The trigger delay (1-999ms for general trigger mode/ 0.01-5.00ms for highlight trigger mode) can be adjusted through encoder or software. A decimal point will appear under highlight trigger mode where maximum value will not exceed 5.00.

4、Software Operation Instructions

4.1 Software interface description

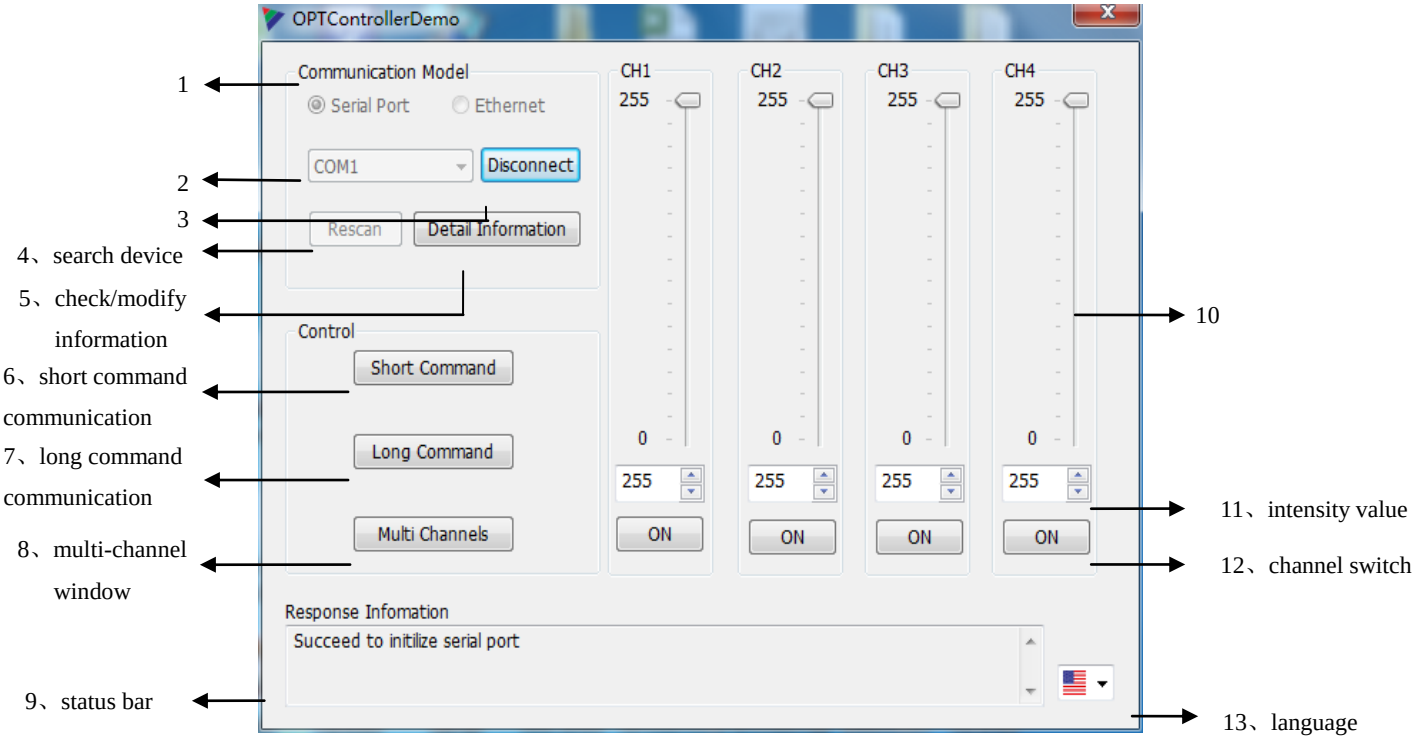


Fig.4.1: Main window

Index	Interface	Description	Remark
1	Choose communication mode	RS232 (serial port) or Ethernet communication	
2	Choose device	For serial port communication, proper communication is determined by serial port number. Ethernet communication is determined by unique serial number (can be found on the right-upper panel of the controller) of the controller.	
3	(Dis)connection	After choosing the proper device, click “connect” to establish communication or “disconnect” to destroy the communication.	
4	Search device	Searching available devices.	
5	Verify/modify information	Click “Detailed information”, one can verify or modify the detailed communication parameters. For serial port communication, one can verify serial port number and for Ethernet communication, one can verify the IP configuration but only the IP address can be modified.	
6	short command communication	common functions for single channel communication	

7	long command communication	common functions for multiple channel communication	
8	multi-channel window	extension to control the intensity for 16 channels	
9	status bar	Show the status of the communication	
10	slider for setting intensity	The intensity of the corresponding channel can be adjusted by moving the slider.	
11	intensity value	Type in the intensity value to be set.	
12	channel switch	Turn on/off the corresponding channel.	
13	language	Switch language between Chinese and English.	

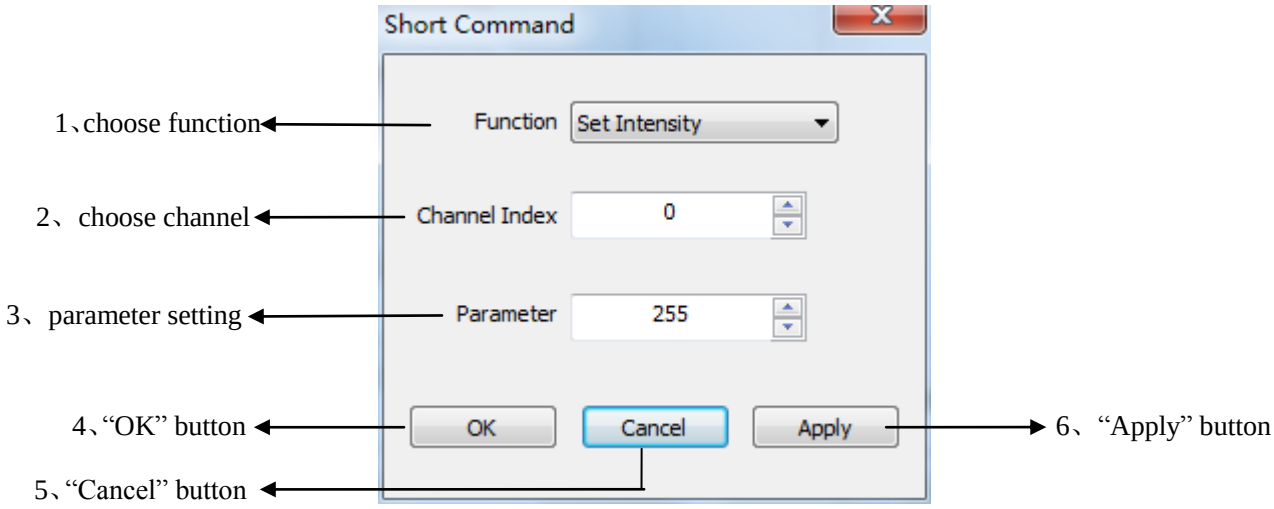


Fig.4.2: Short command communication window

Index	Interface	Description	Remark
1	choose function	choose function	
2	choose channel	choose channel(s) for operation	
3	parameter setting	set the parameter for the corresponding function	
4	“OK” button	send data then quit	
5	“Cancel” button	quit	
6	“Apply” button	send data	

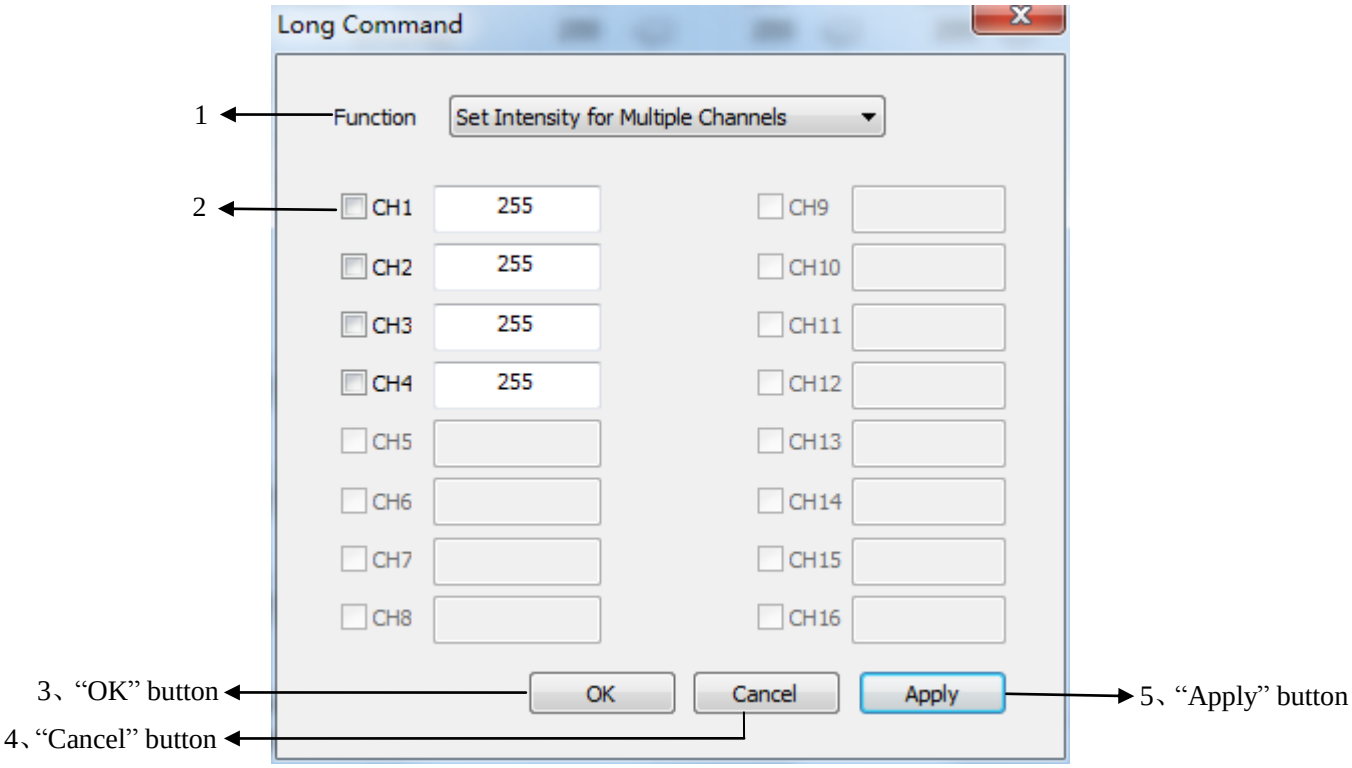


Fig.4.3: Long command communication window

Index	Interface	Description	Remark
1	Choose function	Choose function	
2	Choose channel	Tick the box to choose the channel for operation	
3	"OK" button	Send data then quit	
4	"Cancel" button	Quit	
5	"Apply" button	Send data	

Fig.4.3: Multi-channel window

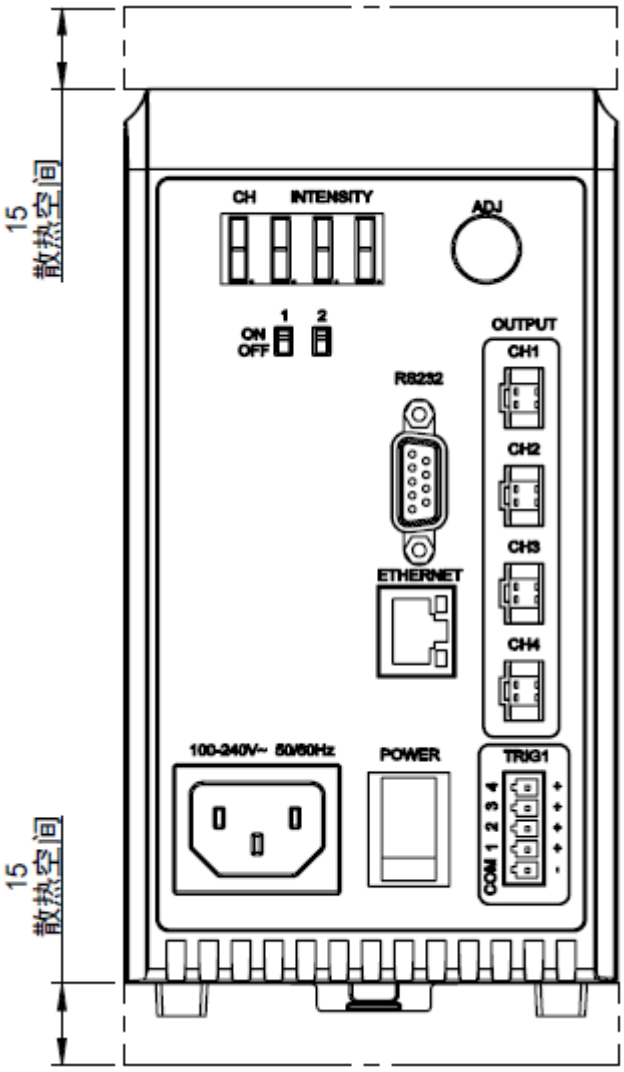
Index	Interface	Description	Remark
1	Intensity setting slider	The intensity for each channel can be adjusted by moving the slider.	
2	Intensity value	choose the channel and type in the intensity value	
3	Channel switch	Turn on/off the corresponding channel.	

OPT MACHINE VISION TECH.CO. LTD
ADD:8 JingSheng Road, JingXia ChangAn DongGuan China 523853
TEL: 0769-82716188 FAX: 0769-81606698
E-mail:optmv1@optmv.com Website:Http://www.optmv.net

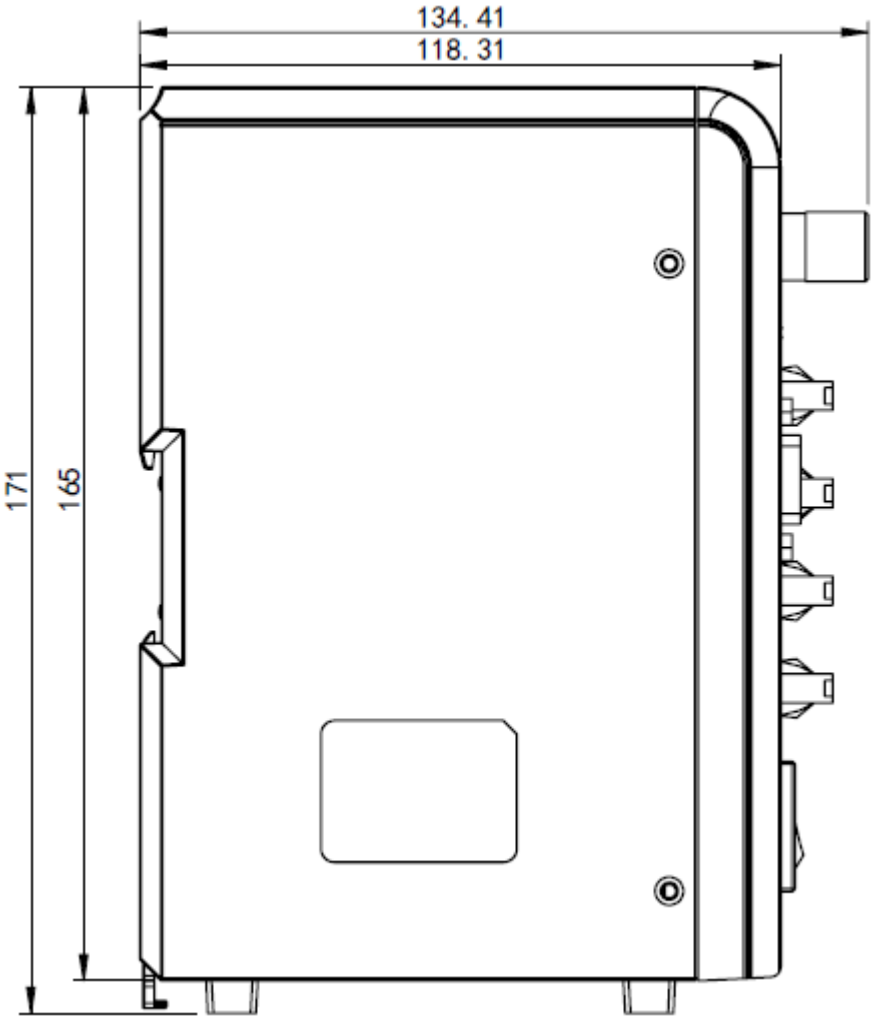
4.2 Software function description

Function	Operation	Show window
Set intensity	Choose the channel(s) (0 means all channels), set the intensity within the range: 0-255	short/long command
Set trigger pulse width	Choose the channel(s) (0 means all channels), set the trigger pulse width within the range: 0-999 (unit: ms). Then click “OK” or “Apply” button.	short/long command
Set highlight trigger pulse width	Choose the channel(s) (0 means all channels), set the trigger pulse width within the range: 0-500 (unit: 0.01ms). Then click “OK” or “Apply” button.	short/long command
Turn off channel(s)	Choose the channel(s) (0 means all channels), set the trigger pulse width within the range: 0-500 (unit: 0.01ms). Then click “OK” or “Apply” button.	short/long command
Turn on channel(s)	Choose the channel(s) (0 means all channels), set the trigger pulse width within the range: 0-500 (unit: 0.01ms). Then click “OK” or “Apply” button.	short/long command
Read intensity	Choose the channel then click “OK” or “Apply” button.	short command
Read trigger pulse width	Choose the channel then click “OK” or “Apply” button.	short command
Read highlight trigger pulse width	Choose the channel then click “OK” or “Apply” button.	short command
Read ID	Click “detailed information”, one can check the ID of the controller.	check/modify information
Read IP configuration.	Click “detailed information”, one can check the Click “detailed information”, you can check the ID of the controller. of the controller.	check/modify information
Static/ dynamic IP switch	DHCP check box. When it is ticked, the IP is dynamic. Otherwise, it is static. Default setting is dynamic IP factory IP address: 192.168.1.16 subnet Mask: 255.255.255 default gateway: 192.168.1.1	check/modify information
Set IP configuration.	The IP need to be static.	check/modify information

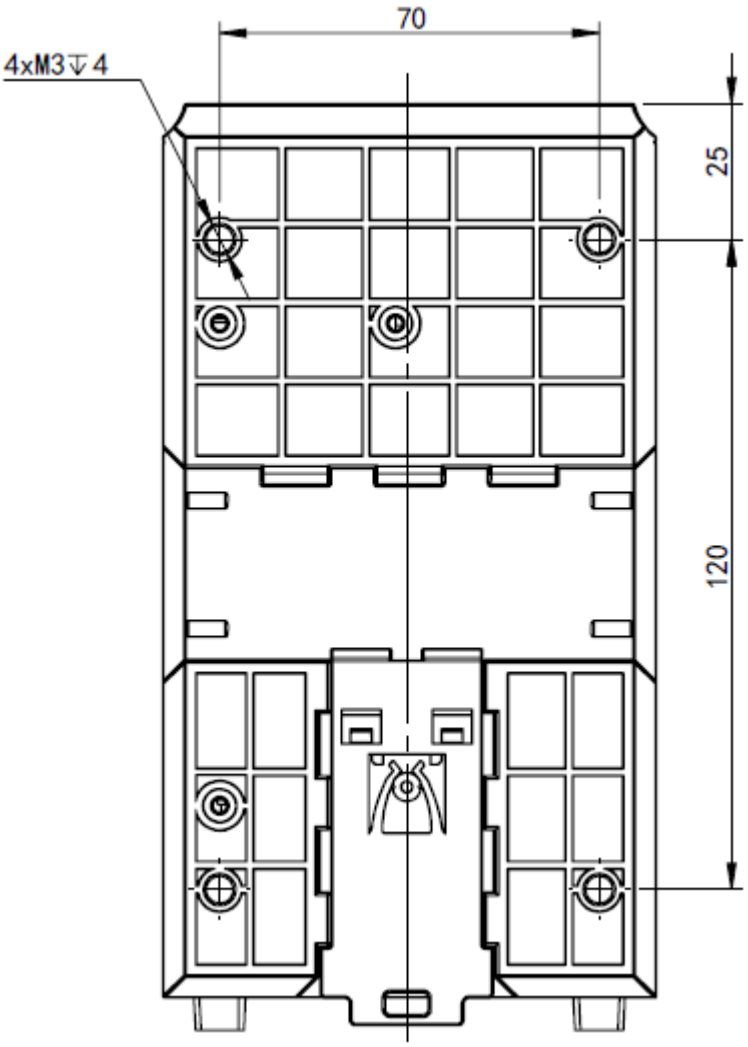
5、Appendix A: Mechanical parameter



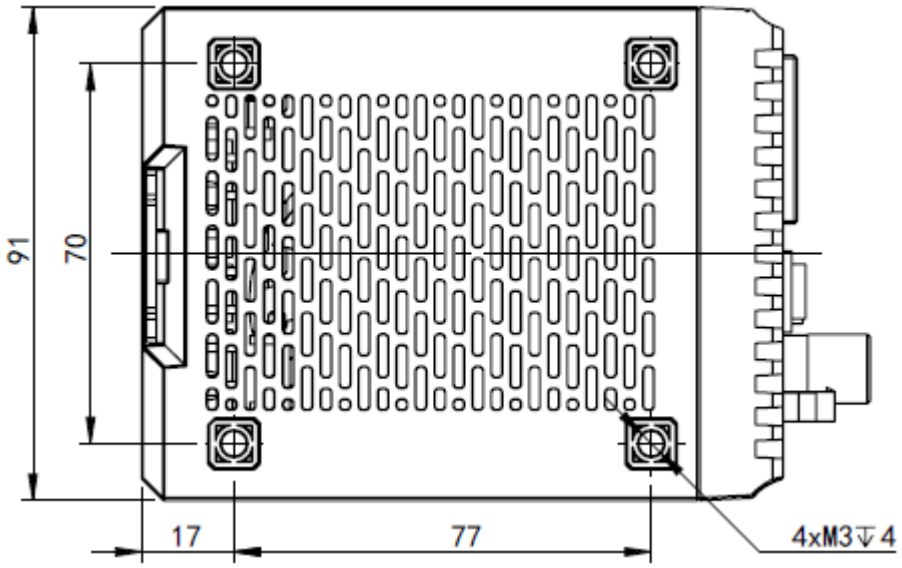
Front view



Left view



Back view



Top view

6、Appendix B: Programming Manual

1. Overview

This programming manual is a specification for OPT Digital Light Source Controller (OPT-DCA24E), which can support both serial port and Ethernet communication (the latter is recommended).

1.1. Configuration

The controller has an default IP address: 192.168.1.16, which can be dynamically allocated by a router. In the case that the IP address of your device(s) is not in the form of 192.168.1.X (X can be any integer within [0,255]), say 192.168.24.X, we should configure the IP address of the controller accordingly (e.g., 192.168.24.X1).For a switch without DHCP Server, we have integrated a tool in our demonstration program.

Please note the following things when using the controller:

1. Only one controller can be connected.

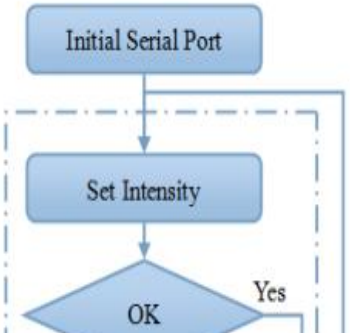
2. Make sure that here is no IP address conflict, i.e., one device one IP (include the controller). Otherwise, the connection will not be established.

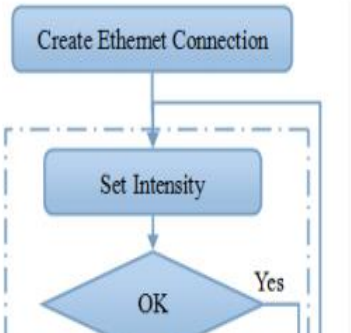
3. So far, the controller doesn't support wireless connection.

1.2. Controller default settings

1. Baud rate: 9600.
2. The IP address of the controller is dynamically allocated.
3. No check word in communication commands.
4. Back up is enabled when power off .
5. Communication response is enabled.

1.3. Programming flowchart





a) an example flowchart for serial port communication b) an example flowchart for Ethernet communication

Figure 1: Flowcharts for the two types communication (Here, we simply take setting the intensity for example.), respectively. All the steps within dashed rectangle, which are achieved with function codes, are replaceable.

1.4. Example programs

We recommend 20ms time interval between a pair of "Set" and "Read" operations, offering room for the controller to react.

1.4.1 An example in C#

```
using System;
using System.Collections.Generic;
using System.Linq;
using System.Text;


namespace OPTController
{
    class Program
    {

        static private int IntensityValue = 0;
        static void Main(string[] args)
        {
```

```
OPTControllerAPI OptController = new OPTControllerAPI();
do
{
    //OptController.InitSerialPort("COM1");
    //Create an Ethernetconnection by IP address    e.g. “192.168.1.16”
        if (0 !=OptController.CreateEtheConnectionByIP("192.168.1.16") )
    {
        Console.WriteLine("Connection failed");
        break;
    }
    //Set the intensity 0 to all channels
    if (0 != OptController.SetIntensity( 0, 0))
    {
        Console.WriteLine("Failed to set intensity 0 for all channels");
        break;
    }
    //Set the intensity 255 to channel 1
    if (0 != OptController.SetIntensity( 0, 255))
    {
        Console.WriteLine("Failed to set intensity 255 for all channels ");
        break;
    }
    //Read the intensity of the 1st chanel
    if (0 != OptController.ReadIntensity( 1, ref(IntensityValue)))
    {
        Console.WriteLine(IntensityValue);
        Console.WriteLine("Failed to read intensity for the 1st channels ");
        break;
    }
    //Turn off all chanels
    if (0 != OptController.TurnOffChannel( 0))
    {
        Console.WriteLine("Failed to turn off all channels");
        break;
    }
    //Turn on all channels
    if (0 != OptController.TurnOnChannel( 0))
    {
        Console.WriteLine("Failed to turn on all channels");
        break;
    }
} while (false);
```

```
            //Destroy the connection
            int ret = 0;
            ret = OptController.DestoryEtheConnect();
            if (0 != ret)
            {
                Console.WriteLine("Failed to destroy the connection");
            }
            else
            {
                Console.WriteLine("DONE");
            }
            Console.ReadKey();
        }
    }
}
```

Note: Please tick “Allow unsafe code” in (ProjectName — Properties — Build).

1.4.2 An example in VC++

```
//Connect to controller

OPTController_InitSerialPort(W2A(strCOMName.GetBuffer(0)), &m_OPTControllerHandle);

// OPTController_CreateEtheConnectionBySN(W2A(strSNe.GetBuffer(0)), &m_OPTControllerHandle);

// OPTController_DestoryEtheConnection(m_OPTControllerHandle);


// Turn on the 1st channel

OPTController_TurnOnChannel ( m_OPTControllerHanlde , 1 ) ;
//Turn off the 1st channel
OPTController_TurnOffChannel( m_OPTControllerHanlde , 1 ) ;

// Set the intensity 255 to the 3rd channel
OPTController_SetIntensity( m_OPTControllerHanlde ,3 , 255 ) ;


// Destroy the connection with the controller

// OPTController_DestoryEtheConnection(m_OPTControllerHandle);

OPTController_ReleaseSerailPort(m_OPTControllerHandle);
```

1.4.3 An example in VB

```
'Create a connection to the controller
```

```
Dim IPAddress As String

IPAddress = "192.168.18.20"

Dim controllerHandle As Integer

OPTControllerAPI.OPTController_CreateEtheConnectionByIP(IPAddress,controllerHandle)


'Turn on/off    NO.1 channel
OPTControllerAPI.OPTController_TurnOnChannel(controllerHandle,1)
OPTControllerAPI.OPTController_TurnOffChannel(controllerHandle,1)


'Set intensity to NO.1 channel
OPTControllerAPI.OPTController_SetIntensity(controllerHandle,1,255)


'Read the intensity of NO.1 channel(channel range 1 to 16),before you read the intensity,you need to delay
Dim nIntensity As Integer
Threading.Thread.Sleep(100)

OPTControllerAPI.OPTController_ReadIntensity(controllerHandle, 1, nIntensity)

'Disconnect the controller

OPTControllerAPI.OPTController_DestoryEtheConnection(controllerHandle)
```

2. Function Specification

2.1. Initializing a serial port

1. Function: long OPTController InitSerialPort(char ∗comName, OPTController HANDLE *controller-Handle)
2. Description: initialize an available serial port
3. Input(s): comName – the name of the serial port. e.g., COM1
4. Output(s): controllerHandle – a handle of the controller
5. Return value:
   - succeed: OPT SUCCEED;
   - failed: OPT ERR INITSERIAL FAILED or OPT ERR SERIALPORT UNOPENED (see the error code in Tab. 1).
6. See also: releasing a serial port

2.2. Releasing a serial port

1. Function: long OPTController ReleaseSerialPort(OPTController HANDLE controllerHandle)

2. Description: release an existing serial port

3. Input(s) controllerHandle – the handle of the controller

4. Return value:

- succeed: OPT SUCCEED;
- failed: OPT ERR RELEASESERIALPORT FAILED (see the error code in Tab. 1).

5. See also: initializing a serial port

2.3. Creating an Ethernet connection (by IP)

1. Function: long OPTController CreateEtheConnectionByIP(char *serverIPAddress, OPTController Handle *controllerHandle)

2. Description: create an Ethernet connection by IP address

3. Input(s) char *serverIPAddress – the IP of the server. e.g., IP address of the device which is employed as server §The server IP address can be 127.0.0.1

4. Output(s): controllerHandle – the handle of the controller

5. Return value

- succeed: OPT SUCCEED;
- failed: OPT ERR CREATEETHECON FAILED (see the error code in Tab. 1).

6. Remarks: connect to a server as a client. Before connecting, make sure that the controller is connected to the LAN.

7. See also: destroying an Ethernet connection

2.4. Creating an Ethernet connection (by SN)

1. Function: long OPTController CreateEtheConnectionBySN(char *serialNumber, OPTController Handle *controllerHandle)

2. Description: create an Ethernet connection by serial number

3. Input(s) serialNumber – the serial number of the controller

4. Output(s): controllerHandle – the handle of the controller

5. Return value

- succeed: OPT SUCCEED;

- failed: OPT ERR CREATEETHECON FAILED (see the error code in Tab. 1).

6. Remarks:
   - connect to a server as a client. Before connecting, make sure that the controller is connected to the LAN;
   - We recommend creating an Ethernet connection by SN (compared with by IP) because IP is likely to be changed dynamically in LAN under the DHCP protocol. We have provided a tool (Search-ForControllers.exe) to check SN.
7. See also: destroying an Ethernet connection

2.5. Destroying an Ethernet connection

1. Function: long OPTController DestroyEtheConnection(OPTController HANDLE controllerHandle)
2. Description: disconnect an existing Ethernet Connection
3. Input(s) controllerHandle – the handle of the controller
4. Return value
   - succeed: OPT SUCCEED;
   - failed: OPT ERR DESTORYETHECON FAILED (see the error code in Tab. 1).
5. See also: creating an Ethernet connection

2.6. Turning on channel(s)

1. Function: long OPTController TurnonChannel(OPTController Handle controllerHandle, int channelIndex)
2. Description: turn on the specified channel(s)
3. Input(s):
   - controllerHandle – the handle of controller;
   - channelIndex – the index(es) of the channel(s) to be turned on, range: [0 – 16] (in decimal form, 0 for all channels).
4. Return value:
   - succeed: OPT SUCCEED;

- failed: OPT ERR TURNONCH FAILED or OPT ERR CHINDEX OUTRANGE (see the error code Tab. 1).

5. See also: turning off channel(s)

2.7. Turning on multiple channels

1. Function: long OPTController TurnOnMultiChannel(OPTController Handle controllerHandle, int* channelIndexArray, int length)
2. Description: turn on the specified multiple channels
3. Input(s):
   - controllerHandle – the handle of controller;
   - channelIndexArray -an array consists of the indexes of the channels to be turned on, range: [1 – 16] (in decimal form);
   - length – the length of the channel index array.
4. Return value:
   - succeed: OPT SUCCEED;
   - failed: OPT ERR TURNONCH FAILED or OPT ERR CHINDEX OUTRANGE (see the error code in Tab. 1).

5. See also: turning off multiple channels.

2.8. Turning off channel(s)

1. Function: long OPTController TurnoffChannel(OPTController Handle controllerHandle, int channelIndex)
2. Description: turn off the specified channel(s)
3. Input(s):
   - controllerHandle – the handle of controller;
   - channelIndex – the index(es) of the channel(s) to be turned off, range: [0 – 16] (in decimal form, 0 for all channels).
4. Return value:
   - succeed: OPT SUCCEED;

- failed: OPT ERR TURNOFFCH FAILED or OPT ERR CHINDEX OUTRANGE (see the error code in Tab. 1).

5. See also: turning on channel(s).

2.9. Turning off multiple channels

1. Function: long OPTController TurnOffMultiChannel(OPTController Handle controllerHandle, int* channelIndexArray, int length)
2. Description: turn off the specified multiple channels
3. Input(s):
   - controllerHandle – the handle of controller;
   - channelIndexArray – an array consists of the indexes of the channels to be turned off, range: [1 – 16] (in decimal form);
   - length – the length of the channel index array.
4. Return value:
   - succeed: OPT SUCCEED;
   - failed: OPT ERR TURNOFFCH FAILED or OPT ERR CHINDEX OUTRANGE (see the error code in Tab. 1).
5. See also: turning on multiple channels

2.10. Setting intensity

1. Function: long OPTController SetIntensity(OPTController Handle controllerHandle, int channelIndex, int intensity)
2. Description: set intensity for the specified channel(s)
3. Input(s):
   - controllerHandle – the handle of controller;
   - channelIndex – the index(es) of the channel(s), range: [0 – 16] (in decimal form, 0 for all channels);
   - intensity –the intensity value, range: [0 – 255] (in decimal form).
4. Return value:
   - succeed: OPT SUCCEED;

- failed: OPT ERR SET INTENSITY FAILED, OPT ERR CHINDEX OUTRANGE, or OPT ERR PARAM OUTRANGE (see the error code in Tab. 1).

5. See also: reading intensity

2.11. Setting multiple intensity

1. Function: long OPTController SetMultiIntensity (OPTController Handle controllerHandle, IntensityItem* intensityArray, int length)
2. Description: set intensities for the specified multiple channels
3. Input(s):
   - controllerHandle – the handle of controller;
   - intensityArray – an array consists of the intensities (and the indexes of the corresponding channels) to be set, range: [0 – 255] (in decimal form);
   - length – the length of the intensity array.
4. Return value:
   - succeed: OPT SUCCEED;
   - failed: OPT ERR SET INTENSITY FAILED or OPT ERR PARAM OUTRANGE (see the error code Tab. 1).
5. See also: reading intensity.

2.12. Reading intensity

1. Function: long OPTController ReadIntensity(OPTController Handle controllerHandle, int channelIndex, int *intensity)
2. Description: read intensity of the specified channel
3. Input(s):
   - controllerHandle – the handle of controller;
   - channelIndex – the index of the channel, range: [1 – 16] (in decimal form).
4. Output(s): intensity – the obtained intensity value
5. Return value:
   - succeed: OPT SUCCEED;

- failed: OPT ERR READ INTENSITY FAILED or OPT ERR CHINDEX OUTRANGE (see the error code in Tab. 1).

6. See also: setting intensity

2.13. Setting the trigger pulse width

1. Function: long OPTController SetTriggerWidth(OPTController Handle controllerHandle, int channelIndex, int triggerWidth)
2. Description: set trigger pulse width for corresponding channel(s)
3. Input(s):

   - controllerHandle – the handle of controller;
   - channelIndex – the index(es) of the channel(s), range: [0 – 16] (in decimal form, 0 for all channels);
   - triggerWidth – the value of the trigger pulse width to be set, range: [1 – 999].

4. Return value:

   - succeed: OPT SUCCEED;
   - failed: OPT ERR SET TRIGGERWIDTH FAILED, OPT ERR CHINDEX OUTRANGE, or OPT ERR PARAM OUTRANGE (see the error code in Tab. 1).

5. See also: reading the trigger pulse width

2.14. Setting multiple trigger pulse width

1. Function: long OPTController SetTriggerWidth(OPTController Handle controllerHandle, TriggerWidthItem* triggerWidthArray, int length)
2. Description: set trigger pulse width for specified the multiple channels
3. Input(s):

   - controllerHandle – the handle of controller;
   - triggerWidthArray – an array consists of values of the trigger pulse width (and the indexes of the corresponding channels) to be set, range: [1 – 999];
   - length – the length of the trigger width array.

4. Return value:

- succeed: OPT SUCCEED;
- failed: OPT ERR SET TRIGGERWIDTH FAILED, OPT ERR CHINDEX OUTRANGE, or OPT ERR PARAM OUTRANGE (see the error code in Tab. 1).

5. See also: reading the trigger pulse width

2.15. Reading the trigger pulse width

1. Function: long OPTController ReadTriggerWidth(OPTController Handle controllerHandle, int channelIndex, int* triggerWidth)
2. Description: read the trigger pulse width of the specified channel
3. Input(s):
   - controllerHandle – the handle of controller;
   - channelIndex – the index of the channel, range: [1 – 16] (in decimal form).
4. Output(s): triggerWidth –the obtained trigger pulse width;
5. Return value:
   - succeed: OPT SUCCEED;
   - failed: OPT ERR READ TRIGGERWIDTH FAILED or OPT ERR CHINDEX OUTRANGE (see the error code in Tab. 1).
6. See also: setting the trigger pulse width and setting multiple trigger pulse width

2.16. Setting high brightness trigger pulse width

1. Function: long OPTController SetHBTriggerWidth(OPTController Handle controllerHandle, int channelIndex, int HBTriggerWidth)
2. Description: set high brightness trigger pulse width for corresponding channel(s);
3. Input(s):
   - controllerHandle – the handle of controller;
   - channelIndex – the index(es) of the channel(s), range: [0 – 16] (in decimal form, 0 for all channels);
   - HBTriggerWidth – the value of the high brightness trigger pulse width to be set, range: [1 – 500].
4. Return value:
   - succeed: OPT SUCCEED;

- failed: OPT ERR SET HBTRIGGERWIDTH FAILED, OPT ERR CHINDEX OUTRANGE, or OPT ERR PARAM OUTRANGE (see the error code in Tab. 1).

5. See also: reading the high brightness trigger pulse width.

2.17. Setting multiple high brightness trigger pulse width

1. Function: long OPTController SetMultiHBTriggerWidth(OPTController Handle controllerHandle, HB-TriggerWidthItem* triggerWidthArray, int length)
2. Description: set high brightness trigger pulse width for the specified multiple channels
3. Input(s):
   - controllerHandle – the handle of controller;
   - triggerWidthArray – an array consists of values of the high brightness trigger pulse width (and the indexes of the corresponding channels) to be set, range: [1 – 500];
   - length – the length of the high brightness trigger width array.
4. Return value:
   - succeed: OPT SUCCEED;
   - failed: OPT ERR SET HBTRIGGERWIDTH FAILED, OPT ERR CHINDEX OUTRANGE, or OPT ERR PARAM OUTRANGE (see the error code in Tab. 1).
5. See also: reading the high brightness trigger pulse width

2.18. Reading the high brightness trigger pulse width

1. Function: long OPTController ReadHBTriggerWidth(OPTController Handle controllerHandle, int chan-nelIndex, int* HBTriggerWidth)
2. Description: read the high brightness trigger pulse width of the specified channel;
3. Input(s):
   - controllerHandle – the handle of controller;
   - channelIndex – the index of the channel, range: [1 – 16] (in decimal form).
4. Output(s): HBTriggerWidth – the obtained high brightness trigger pulse width;
5. Return value
   - succeed: OPT SUCCEED;

- failed: OPT ERR READ HBTRIGGERWIDTH FAILED, OPT ERR CHINDEX OUTRANGE(see the error code in Tab. 1).

6. See also: setting high brightness trigger pulse width and setting multiple high brightness trigger pulse width.

2.19. Enable response

1. Function: OPTController EnableResponse(OPTController Handle controllerHandle, bool isResponse)
2. Description: to set whether return value are needed or not
3. Input:
   - controllerHandle –the handle of controller;
   - isResponse –“true” means “need return value” while “false” stands for not.
4. Return value
   - succeed: OPT SUCCEED;
   - failed: OPT ERR UNKOWN (see the error code in Tab. 1).

2.20. Enable checksum

1. Function: OPTController EnableCheckSum(OPTController Handle controllerHandle, bool isCheckSum)
2. Description: to set whether checksum are needed or not
3. Input:
   - controllerHandle –the handle of controller;
   - isCheckSum –“true” means “need checksum” while “false” stands for not.
4. Return value
   - succeed: OPT SUCCEED;
   - failed: OPT ERR UNKOWN (see the error code in Tab. 1).

2.21. Enable back up when power off

1. Function: OPTController EnablePowerOffBackup(OPTController Handle controllerHandle, bool isBack-up)
2. Description: to set whether backup are needed or not in the case of power off
3. Input:

- controllerHandle –the handle of controller;
- isBackup –“true” means “need backup” while “false” stands for not.

4. Return value
   - succeed: OPT SUCCEED;
   - failed: OPT ERR UNKOWN (see the error code in Tab. 1).

2.22. Reading serial number

1. Function: long OPTController ReadSN(OPTController Handle controllerHandle, char *SN)
2. Description: read the serial number (SN) of the controller
3. Input(s): controllerHandle – the handle of controller
4. Output(s): SN – the obtained serial number
5. Return value
   - succeed: OPT SUCCEED;
   - failed: OPT ERR READ SN FAILED (see the error code in Tab. 1).

2.23. Reading IP configuration

1. Function: long OPTController ReadIPConfig(OPTController Handle controllerHandle, char *IP, char *subnetMask, char *defaultGateway)
2. Description: read IP configuration of the controller
3. Input(s): controllerHandle – the handle of controller
4. Output(s):
   - IP – the obtained IP address;
   - subnetMask – the obtained subnet mask;
   - defaultGateway – the obtained default gateway.
5. Return value
   - succeed: OPT SUCCEED;
   - failed: OPT ERR READ IPCONFIG FAILED (see the error code in Tab. 1).

3. Appendices

A FAQ (frequently asked questions)

A.1 Why the controller does not respond properly to continuous operations?

We recommend 20ms time interval between a pair of "Set" and "Read" operations, offering room for the controller to react.

A.2 Are there long delays during Ethernet connection?

No, there aren't. If the connection isn't established within 50ms (i.e. the timeout is 50ms.), then it failed.

A.3 Why the functions return error codes while in fact the corresponding operations are successfully done?

Please check whether the responses from the functions are enabled (see how to enable response in Sect. 2.19).

A.4 Why the controller can't find any available PC serial port or serial port connection can't be established?

If the PC is equipped with WIN7 OS, please try to run as administrator.

A.5 Why the controller can't be opened (system errors are reported.)?

To tackle this problem, please install VS2008 runtime library.

A.6 Why the controller can't be properly connected after modifying its MAC address?

Please reboot the controller after modifying its MAC address

B Macro Definitions for Error Codes

Table 1: Error code

Macro Name	Error Code	Remark
OPT SUCCEED	0	operation succeed
OPT ERR INVALIDHANDLE	3001001	invalid handle
OPT ERR UNKNOWN	3001002	error unknown
OPT ERR INITSERIAL FAILED	3001003	failed to initialize a serial port

OPT ERR RELEASESERIALPORT FAILED	3001004	failed to release a serial port
OPT ERR SERIALPORT UNOPENED	3001005	attempt to access an unopened serial port
OPT ERR CREATEETHECON FAILED	3001006	failed to create an Ethernet connection
OPT ERR DESTROYETHECON FAILED	3001007	failed to destroy an Ethernet connection
OPT ERR SN NOTFOUND	3001008	SN is not found
OPT ERR TURNONCH FAILED	3001009	failed to turn on the specified channel(s)
OPT ERR TURNOFFCH FAILED	3001010	failed to turn off the specified channel(s)
OPT ERR SET INTENSITY FAILED	3001011	failed to set the intensity for the specified channel(s)
OPT ERR READ INTENSITY FAILED	3001012	failed to read the intensity for the specified channel
OPT ERR SET TRIGGERWIDTH FAILED	3001013	failed to set trigger pulse width
OPT ERR READ TRIGGERWIDTH FAILED	3001014	failed to read trigger pulse width
OPT ERR SET HBTRIGGERWIDTH FAILED	3001015	failed to set high brightness trigger pulse width
OPT ERR READ HBTRIGGERWIDTH FAILED	3001016	failed to read high brightness trigger pulse width
OPT ERR READ SN FAILED	3001017	failed to read serial number of the controller
OPT ERR READ IPCONFIG FAILED	3001018	failed to read IP configuration of the controller
OPT ERR CHINDEX OUTRANGE	3001019	index(es) of channel(s) out of the range
OPT ERR WRITE FAILED	3001020	failed to write data
OPT ERR PARAM OUTRANGE	3001021	parameter(s) out of the range

Note: for acronyms, please refer to Tab. 2

C Acronyms

Table 2: Acronyms

Acronym	Meaning
CH	channel
CON	connection
CONFIG	configuration
CUR	current
ERR	error

ETHE	Ethernet
HB	high brightness
PARAM	parameter
SN	serial number